What is claimed is:

1. A semiconductor device comprising:

a semiconductor substrate in which a semiconductor element is formed;

an interlayer insulating film formed on said semiconductor substrate;

an insulating barrier layer, formed on said interlayer insulating film, for preventing diffusion of a metal contained in a wiring layer;

a conductive barrier layer, formed on said insulating barrier layer, for preventing diffusion of said metal; and

a wiring layer containing said metal on said conductive barrier layer.

2. The semiconductor device according to claim 1, wherein said insulating barrier layer is a denatured layer obtained by plasma-nitriding a surface of said interlayer insulating film.

3. The semiconductor device according to claim 2, wherein said denatured layer contains at least one selected from the group consisting of Si_xN_y and $Si_xN_yO_z$ (x, y, and z are positive numbers).

4. The semiconductor device according to claim 1, wherein said insulating barrier layer has a thickness of 1 to 100 nm.

5. The semiconductor device according to claim 1, wherein said conductive barrier layer contains

a member selected from the group consisting of Al, Ti, TiN, Nb, W, a lamination of layers of at least two of these members, and an alloy of at least two of these members.

6. The semiconductor device according to claim 1, wherein another conductive barrier layer for preventing diffusion of said metal is formed on a side surface of said wiring layer, and another insulating barrier layer for preventing diffusion of said metal is formed on said other conductive barrier layer.

7. The semiconductor device according to claim 6, wherein another conductive barrier layer for preventing diffusion of said metal is furhter formed on a top surface of said wiring layer, and another insulatign barrier layer for preventing diffusion of said metal is formed on said other conductive barrier layer.

8. A process of fabricating a semiconductor device, comprising the steps of:

forming a semiconductor element in a semiconductor substrate;

forming an interlayer insulating film on said semiconductor substrate;

denaturing a surface of the interlayer insulating film by plasma-nitriding the interlayer insulating film, thereby forming an insulating barrier layer for preventing diffusion of a metal contained in a wiring

layer; and

forming a wiring layer containing said metal on said conductive barrier layer.

9. The process according to claim 8, wherein said denatured layer is formed of at least one selected from the group consisting of Si_xN_y and $Si_xN_yO_z$ (x, y, and z are positive numbers).

10. The process according to claim 8, wherein said denatured layer has a thickness of 1 to 100 nm.

11. The process according to claim 8, further comprising the step of forming a conductive barrier layer, on said insulating barrier layer, for preventing diffusion of said metal.

12. The process according to claim 11, wherein said conductive barrier layer contains a member selected from the group consisting of Al, Ti, TiN, Nb, W, a lamination of layers of at least two of these members, and an alloy of at least two of these members.

13. A semiconductor device comprising:

an insulating film formed on a semiconductor substrate and having a wiring groove;

a denatured layer formed by plasma nitriding treatment on an inner surface of said wiring groove; and

a wiring layer formed in said wiring groove on inner surface of which said denatured layer is formed.

14. The semiconductor device according to

claim 13, wherein said denatured layer contains at least one selected from the group consisting of Si_xN_y and $Si_xN_yO_z$ (x, y, and z are positive numbers).

15. The semiconductor device according to claim 13, wherein said denatured layer has a thickness of 1 to 100 nm.

16. The semiconductor device according to claim 13, wherein a conductive barrier layer for preventing diffusion of a metal constituting said wiring layer is formed between said denatured layer and said wiring layer.

17. The semiconductor device according to claim 13, wherein said conductive barrier layer contains a member selected from the group consisting of Al, Ti, TiN, Nb, W, a lamination of layers of at least two of these members, and an alloy of at least two of these members.

18. A process of fabricating a semiconductor device, comprising the steps of:

forming an insulating film on a semiconductor substrate;

forming a wiring groove in said insulating film;

forming a denatured layer on an inner surface of said wiring groove by plasma-nitriding a surface of said insulating film; and

forming a wiring layer in said wiring groove on inner surface of which said denatured layer is formed.

19. The process according to claim 18, wherein said denatured layer is formed of at least one selected from the group consisting of Si_xN_y and $Si_xN_yO_z$ (x, y, and z are positive numbers).

20. The process according to claim 18, wherein said denatured layer has a thickness of 1 to 100 nm.

21. The process according to claim 18, further comprising a step of forming a conductive barrier layer on said denatured layer.

22. The process according to claim 18, wherein said conductive barrier layer is formed of a metal selected from the group consisting of Al, Ti, TiN, Nb, W, a lamination of layers of at least two of these elements, and an alloy of at least two of these elements.

23. The process according to claim 18, wherein in said step of forming the wiring layer in said wiring groove on an inner surface of which said denatured layer is formed, a conductive material is deposited by anisotropic deposition method on said insulating film including said wiring groove to a thickness less than the depth of said wiring groove, thereby separating at a stepped portion a conductive material layer formed within said wiring groove from a conductive material layer formed on the insulating film excluding the wiring groove, and subsequently the conductive material layer formed on the insulating film excluding the

wiring groove is selectively removed.

24. The process according to claim 18, wherein in said step of forming the wiring layer in said wiring groove on an inner surface of which said denatured layer is formed, a conductive material is deposited by anisotropic deposition method on said insulating film including said wiring groove to a thickness less than the depth of said wiring groove, thereby separating at a stepped portion a conductive material layer formed within said wiring groove from a conductive material layer formed on the insulating film excluding the wiring groove, and subsequently a protection film is formed on the entire surface of the resultant structure and said conductive material layer formed on the surface of the insulating film excluding the wiring groove and said protection film are selectively removed.

25. A semiconductor device comprising:

an insulating film formed on a semiconductor substrate;

a denatured layer formed by plasma nitriding treatment on said insulating film; and

a wiring layer formed on said denatured layer.

26. The semiconductor device according to claim 25, wherein said denatured layer contains at least one selected from the group consisting of Si_xN_y and $Si_xN_yO_z$ (x, y, and z are positive numbers).

~~27. The semiconductor device according to claim 25, wherein said denatured layer has a thickness of 1 to 100 nm.~~

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